TITLE OF THE INVENTION

LASER SCANNING UNIT ASSEMBLY AND LASER PRINTER HAVING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the priority of Korean Patent Application No. 2002-57013, filed September 18, 2002 and Korean Patent Application No. 2003-9905, filed February 17, 2003 in the Korean Intellectual Property Office, the disclosures of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates to a laser printer forming an image by scanning a plurality of laser beams, and more particularly, to a laser scan unit assembly capable of adjusting the plurality of laser beams from a plurality of laser scan units to be parallel with each other when scanned onto a photosensitive body, and a laser printer having the same.

Description of the Related Art

[0003] Generally, a laser printer prints a predetermined image by forming the image on a photosensitive body using laser beams emitted from a laser scan unit, and then transferring the image onto paper. A particular type laser printer such as a color laser printer forms an electrostatic latent image on the photosensitive body by emitting a plurality of laser beams from a plurality of laser scan units. Since the plurality of laser scan units are disposed at predetermined intervals to be parallel with each other, the laser beams emitted from the laser scan units are formed on the photosensitive body at predetermined intervals in parallel and create an electrostatic latent image. The laser printer then develops the electrostatic latent image created on the photosensitive body with a developing agent and transfers the developed image onto paper.

[0004] In such a laser printer, laser beams emitted from the laser scan units may not be parallel to each other due to manufacturing tolerances of the parts or assembling error. If the plurality of laser beams are not parallel, each color may be mis-positioned, thereby impairing print quality.

[0005] In order to solve such a problem, conventionally, a laser scan unit assembly adjusts the plurality of laser beams by adjusting angles of the mirrors reflecting the laser beams. Since a mirror unit has a laser scan unit inside, a motor is provided to adjust the angle of the mirror. The laser beams are formed on the photosensitive body in parallel with each other by adjusting the angle of the mirrors with a control unit controlling the motor.

[0006] However, problems occur when adjusting mirrors using a motor. First, the interior temperature of the laser scan unit increases as the temperature of the motor increases when used for a long time, and therefore the life span of the laser scan unit is reduced. Second, manufacturing costs are increased because the motors and the motor control units are required. Finally, space to dispose the additional motor is required, thereby enlarging the size of the laser printer. Therefore, there has been a need for a laser scan unit assembly capable of adjusting a plurality of laser beams on a photosensitive body without having to use a motor.

SUMMARY OF THE INVENTION

[0007] Accordingly, it is an aspect of the present invention to solve the above problems and/or disadvantages and to provide at least the advantages described hereinafter.

[0008] It is another aspect of the present invention to provide a scan unit assembly capable of manually adjusting a plurality of laser beams emitted from a plurality of laser scan units and formed on a photosensitive body to be parallel with each other.

[0009] It is still another aspect of the present invention to provide a laser printer having a laser scan unit assembly capable of manually adjusting a plurality of laser beams formed on a photosensitive body to be parallel with each other.

[0010] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0011] The foregoing and/or other objects and advantages are realized by providing a laser scan unit assembly disposed in a printer body, including a laser scan unit having a window on a front surface thereof through which a laser beam is emitted; a hinge portion provided at a first side of the laser scan unit to pivotably dispose the laser scan unit on the body; and an adjusting portion on a second side of the laser scan unit opposite to the first side to adjust an amount the

laser scan unit pivots. The body has a hinge supporting portion provided thereon to support rotation of the hinge portion.

[0012] The hinge portion is formed as a hinge shaft and the hinge supporting portion is formed as a groove to support the hinge shaft. In addition, the hinge supporting portion further includes a resilient member to press the hinge shaft against the groove.

[0013] The hinge portion is formed as a groove and the hinge supporting portion is formed as a hinge shaft to support the groove.

[0014] In addition, the adjusting portion includes a first adjusting unit provided on the opposite side of the laser scan unit and a second adjusting unit provided on the body. The first adjusting unit is an inclined surface and the second adjusting unit is a screw or alternatively the first adjusting unit is a screw and the second adjusting unit is an inclined surface. A guiding ring is further assembled at an end portion of the screw which is in contact with the inclined surface. In addition, the adjusting portion further includes a pressing unit to press the first adjusting unit against the second adjusting unit.

[0015] The foregoing and/or other aspect of the present invention may also be achieved by providing a laser scan unit assembly disposed in a printer body, including a laser scan unit having a window on a front surface thereof through which a laser beam is emitted; a hinge portion provided at a first side of the laser scan unit to pivotably dispose the laser scan unit on the printer body; and an adjusting portion on a second side of the laser scan unit opposite to the first side to adjust an amount the laser scan unit pivots.

[0016] According to the laser scan unit of the embodiments of the present invention, a plurality of laser beams emitted from a plurality of laser scan units can be manually adjusted to be formed on a photosensitive body in parallel. Furthermore, a laser scan unit including a laser scan unit assembly capable of manually adjusting a plurality of laser beams to be formed on a photosensitive body in parallel is provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the preferred embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a perspective view showing a first embodiment of a laser scan unit assembly according to the present invention;

FIG. 2 is a sectional view showing the laser scan unit of FIG. 1, assembled in a printer body;

FIG. 3 is a side view showing a resilient member disposed in a hinge portion of FIG. 2;

FIG. 4 is a sectional view showing a guiding ring assembled in a screw of FIG. 2;

FIG. 5 is a side sectional view showing a pressing unit disposed in an adjusting portion of FIG. 6;

FIG. 6 is a sectional view showing two laser scan unit assemblies of FIG. 1 assembled in a printer body;

FIG. 7 is a sectional view showing a laser scan unit assembly according to a second embodiment of the present invention assembled in a printer body;

FIG. 8 is a sectional view showing a laser scan unit assembly according to a third embodiment of the present invention assembled in a printer body; and

FIG. 9 is a sectional view showing a laser scan unit assembly according to a fourth embodiment of the present invention assembled in a printer body.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] Reference will now be made in detail to the present preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

[0019] The laser scan unit 10 is an apparatus to scan a laser beam 1, and formed of a unit having a laser light source, a collimator, a cylinder lens, a polygon mirror, an F-θ lens, and a reflector (not shown) that are necessary to scan the laser beam 1. On the front side of the laser scan unit 10, a window 11 is provided to emit the laser beam 1.

[0020] The hinge portion 20 allows the laser scan unit 10 to pivot with respect to a printer body 40 and provided at one side of the laser scan unit 10. That is, when the part of the laser scan unit 10 with the window 11 is considered as a front side, the hinge portion 20 is provided on one of two sides 13, 14 of the laser scan unit 10. The hinge portion 20 is formed as a hinge shaft 21, as shown in FIG. 1. A rotary shaft 22 of the hinge portion 20 and the laser beam 1 emitted from the window 11 are in the same plane. In addition, a hinge supporting portion 25 is formed on the printer body 40 to which the laser scan unit assembly is disposed to correspond with the hinge

portion 20. The hinge supporting portion 25 has a groove 26 to support the hinge portion 20 formed in the shape of the hinge shaft 21. The groove 26 is formed in a V shape. In addition, the hinge shaft 21 is pressed by a resilient member 50 (as shown in FIG. 3) to maintain the hinge shaft 21 and the groove 26 to always stay in contact with each other. The resilient member 50 may use a metal plate having a predetermined resilience and is fastened onto the hinge supporting portion 25 by a plurality of screws 51. The resilience of the resilient member 50 is determined within a range in which the resilient member 50 can maintain the hinge shaft 21 to stay in contact with the groove 26 and at the same time allow the laser scan unit 10 to pivot freely up and down by the adjusting portion 30.

[0021] The adjusting portion 30 adjusts the amount the laser scan unit 10 pivots around the hinge portion 20 and is disposed on the side 14 opposite to the side 13 on which the hinge portion 20 of the laser scan unit 10 is provided. The adjusting portion 30 includes a first adjusting unit 31 disposed on the laser scan unit 10 and a second adjusting unit 31 disposed on the printer body 41. As shown in FIG. 2, the first adjusting unit 31 may be formed as an inclined surface 31a and the second adjusting unit 32 is a screw moving forward and backward with respect to the inclined surface 31a (hereinafter, the second adjusting unit 32 may also be referred to as the screw 32). When the screw 32 is moved forward (in the direction indicated by the arrow) the laser scan unit 10 pivots upward on the hinge portion 20. When the screw 32 is pulled in the opposite direction of the arrow in FIG. 2, the laser scan unit 10 pivots downward on the hinge portion 20. At this time, the screw 32 has a guiding ring 35 at an end portion 32a assembled thereon (as shown in FIG. 4) in order to facilitate contact between the screw 32 and the inclined surface 31a.

[0022] A pressing unit 60 presses the first adjusting unit 31 against the second adjusting unit 32 with a predetermined pressure in order to ensure that the laser scan unit 10 pivots upward and downward by the second adjusting unit 32, as shown in FIG. 5. Referring to FIG. 5, the pressing unit 60 includes a guiding rod 61 fastened on a fastening portion 64 and a spring 62 interposed between the first adjusting unit 31 and the guiding rod 61. The fastening portion 64 guides rectilinear movement of the screw 32 and is disposed on a printer body 41 (FIG. 2) to fasten the guiding rod 61. Therefore, the first adjusting unit 31 presses an end portion 32a (FIG. 2) of the screw 32 with a predetermined pressure at all times.

[0023] Hereinafter, the operation of the laser scan unit assembly structured as above is described. When the end portion 32a of the screw 32 is moved forward in the direction indicated

by the arrow in FIG. 2 by being turned, the laser scan unit 10 pivots upward on the hinge shaft 21 by the inclined surface 31a of the first adjusting unit 31. On the contrary, when the end portion 32a of the screw 32 is pulled by turning the screw 32, the laser scan unit 10 pivots downward on the hinge shaft 21 by the inclined surface 31a. When two laser scan unit assemblies are disposed on the printer body as shown in FIG. 6, laser beams emitted from the two laser scan units 10, 10' can be adjusted to be parallel with each other by adjusting the adjusting portions 30, 30' of each of the laser scan unit assemblies. That is, the two laser beams can be formed on the photosensitive body (not shown) to be parallel with each other by turning the second adjusting units 32, 32' of each laser scan unit assembly, thereby pivoting the laser scan units 10, 10' upward and downward on the hinge portions 21, 21'.

[0024] A second embodiment of the laser scan unit assembly according to the present invention is shown in FIG. 7. Referring to FIG. 7, the laser scan unit assembly according to the second embodiment includes the laser scan unit 10 and the hinge portion 20 (as in the first embodiment), and an adjusting portion 70.

[0025] The hinge portion 20 pivots the laser scan unit 10 with respect to the printer body 40, and is provided at the side 13 of the laser scan unit 10.

[0026] The adjusting portion 70 adjusts the amount the laser scan unit 10 pivots on the hinge portion 20 and is provided on the side 14 opposite to the side 13. The adjusting portion 70 includes a first adjusting unit 72 disposed on the laser scan unit 10 and a second adjusting unit 75 disposed on the printer body 41. As shown in FIG. 7, the first adjusting unit 72 is a screw 72 and the second adjusting unit 75 includes an inclined surface 75a. The screw 72 is assembled in a nut portion 71 formed in the laser scan unit 10. The inclined portion 75a inclines so that the laser scan unit 10 rises when the screw 72 is moved forward in the direction shown by the arrow in FIG. 7 and is fastened on the printer body 41. Therefore, when the screw 72 is turned to be moved forward, the laser scan unit 10 pivots upward by the inclined surface 75a of the second adjusting unit 75. When the screw 72 is moved in the direction opposite to the arrow in FIG. 7, the laser scan unit pivots downward by the inclined surface 75a of the second adjusting unit 75a. As described in the first embodiment, the guiding ring 73 may be assembled on the end portion 72a of the screw in order to facilitate contact between the end portion 72a and the inclined surface 75a. Also, although not shown in FIG. 7, the pressing unit 60 to press the first adjusting unit 72 against the second adjusting unit 75 with a predetermined pressure may be further provided in order to ensure that the laser scan unit 10 pivots upward and downward by the screw 72.

[0027] A third embodiment of the laser scan unit assembly according to the present invention is shown in FIG. 8. Referring to FIG. 8, the laser scan unit assembly according to the third embodiment includes the scan unit 10 (as shown in FIG. 1), a hinge portion 80, and an adjusting portion 30.

[0028] The hinge portion 80 pivots the laser scan unit 10 on the printer body 40, and is provided on the side 13 of the laser scan unit 10. As shown in FIG. 8, the hinge portion 80 is formed as a groove 81. The supporting portion groove 81 is formed in V shape. In addition, a hinge supporting portion 85 is formed on the printer body 40 to which the laser scan unit assembly is disposed to correspond with the hinge portion 80. The hinge supporting unit 85 is formed as a hinge shaft 80. In addition, a resilient member to press the groove 81 to the hinge shaft 85 may be disposed as in the first embodiment in order to maintain the groove 81 of the hinge portion 80 and the hinge supporting unit 85 to always stay in contact with each other.

[0029] The adjusting portion 30 adjusts the amount the laser scan unit 10 pivots around the hinge portion 80, and is disposed on the side 14 opposite to the side 13 on which the hinge portion 80 of the laser scan unit 10 is formed. The adjusting portion 30 is identical to that of the laser scan unit described in the first embodiment and therefore a detailed description is omitted.

[0030] Therefore, in the third embodiment, if the screw 32 of the adjusting portion 30 is turned to be moved forward, the laser scan unit 10 pivots upward, but on the contrary, if the screw 32 is turned to be moved backward, the laser scan unit 10 pivots downward, and accordingly, the laser beams can be adjusted to be parallel with each other.

[0031] FIG. 9 shows the fourth embodiment of the laser scan unit assembly according to the present invention. Referring to FIG. 9, the laser scan unit assembly according to the fourth embodiment includes the laser scan unit 10, the hinge portion 80, and the adjusting portion 70.

[0032] The hinge portion 80 pivots the laser scan unit 10 on the printer body 40, and is provided on the side of the laser scan unit 10. The structure of the hinge portion 80 will not be described again as it is identical to that of the third embodiment.

[0033] The adjusting portion 70 adjusts the amount the laser scan unit 10 pivots around the hinge portion 80, and is disposed on the side 14 opposite to the side 13 on which the hinge portion 80 of the laser scan unit 10 is formed. The adjusting portion 70 is identical to the laser scan unit in the described second embodiment and therefore a detailed description will be

omitted.

[0034] Therefore, in the fourth embodiment, if the screw 72 of the adjusting portion 70 is turned to be moved forward, the laser scan unit 10 pivots upward, but on the contrary, if the screw 72 is turned to be moved backward, the laser scan unit 10 pivots downward, and accordingly the laser beams can be adjusted to be parallel with each other.

[0035] According to the laser scan unit assembly according to the embodiments of the present invention described above, a plurality of laser beams can be adjusted to be formed on the photosensitive body to be parallel with each other by manually turning the adjusting portion. Accordingly, there is no likelihood of the life span of the laser scan unit being shortened due to temperature increase of the motor, and manufacturing costs may be reduced as there is no need for disposing a motor inside the laser scan unit. In addition, the size of a laser printer may be reduced since no separate space is required for disposing a motor control unit.